REMARKS

Claim 1 is currently amended, in order to improve readability. Claims 9-20 are added, which are dependent upon claims 1 or 6 or dependent claims thereof. Support for the new claims is found on pages 11-13 and original claims 2-3. Since claims 7-8 have been withdrawn from consideration, claims 1-6 and 9-20 will be active upon entry of the amendment. No new matter will be added upon entry of the amendment.

Applicants thank Examiner RoDee for conducting the kind and courteous discussion with Applicants' representative on April 27, 2004. During the discussion, Applicants' representative discussed the nature of the carbon black in the resin layer of the carrier particles.

The patentability of the claims appears to hinge on whether or not the cited references describe a carrier for a developer for developing an electrostatic image, comprising core particles, and a resin layer covering each of said core particles and comprising **carbon particles having a number average particle diameter of 0.01-0.1 μm**.

The Office has taken the position that the disclosures of Matsuda (U.S. 6,534,232 or JP 2001-027829) and Yoshino (U.S. 6,534,232) inherently anticipate the claimed invention.

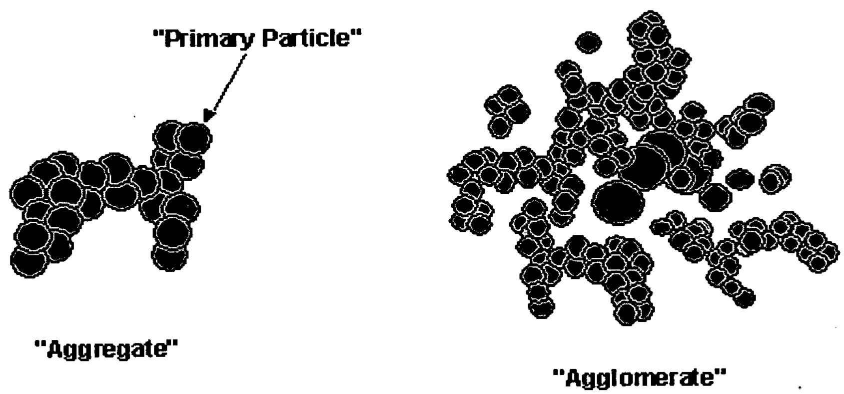
In order to adequately address the issue of inherent anticipation, Applicants' illuminate two lines of evidence that is believed should serve to overcome these rejections. Furthermore, it is believed that there is adequate evidence of record to show that the two disclosures of Matsuda and Yoshino, either alone or taken together, do not render the claimed invention obvious.

It is respectfully requested that the Examiner reconsider the rejections in view of the evidence of record and the following comments.

It is true that both Matsuda and Yoshino describe employing a commercially available form of carbon black that has a predetermined primary particle size. However, as the

Examiner is most aptly aware, primary particles "physically glom" together to form aggregates; which, in turn, undergo agglomeration to form agglomerates (see Figure 1).

Figure 1. Carbon black particles.



Consequently, a sample of commercially available carbon black has a wide ranging number average particle diameter which may be much larger than the primary particle size. Disruption of the agglomeration, i.e., a reduction in the number average particle diameter, may occur when the agglomerates experience shear forces. For example, a shear force that may sufficiently disrupt the agglomerate occurs when carbon particles are mixed in a liquid. Unless one sufficiently describes the manner in which the carbon particles are mixed, it is impossible to know the kinds of shear forces that the carbon black particles experience. Correspondingly, it is impossible to ascertain the number average particle diameter of carbon black in a resin layer that surrounds a core particle.

In short, <u>Matsuda</u> does not describe the number average particle diameter of the carbon black in the resin layer surrounding the core particle; moreover, <u>Matsuda</u> fails to illuminate the conditions whereby carbon black particles are dispersed in a liquid.

Additionally, <u>Yoshino</u> does not describe the number average particle diameter of the carbon black in the resin layer surrounding the core particle; but, <u>Yoshino</u> does provide a mixing time for carbon black particles (col. 9, ℓℓ. 53-55).

As a refresher, the Examiner's attention is directed to the data obtained by the procedures described in the Examples, which shows that the carbon black number average particle diameter (CBDN) is dependent upon mixing and coating conditions. This data is presented in the following table.

Table. Comparative Data for Carriers (I) – (IV)

Property or Condition	Carrier (I)[a]	Carrier (II)[b]	Carrier (III)[c]	Carrier (IV)[d]
Core Particle Size, μm	48	50	48	48
Coating Liquid	I[e]	I[e]	I[e]	II[f]
Dispersion Conditions				
Mixing Temp., °C	35-40	35-40	35-40	35-40
Mixing Time, min	20	20	20	5
Coating Conditions				
Device Temp., °C	70	70	100	70
Heating Conditions	300°C, 2hr	300°C, 2hr	300°C, 2hr	300°C, 2hr
CBDN, nm	**40**	**40**	**7**	**160**
Specific Resistance, Ω·cm	2.0×10^{13}	1.5×10^{13}	7.9×10^{15}	5.0×10^{9}
Image Density	1.41	1.45	1.19	1.50
Reproducibility of Fine Line Image	4	5	4	3
Others	No problem	No problem	Edge Effects	White Spots

[a]p.19, ℓℓ. 10-29. [b]p.24, ℓ. 20 – p. 25, ℓ. 5. [c]p. 25, ℓ. 7 – p. 26, ℓ. 7. [d]p. 27, ℓℓ. 5-19. [e]p. 18, ℓ. 30 – p. 19, ℓ. 9. [f]p. 26, ℓ. 21 – p. 27, ℓ. 4.

Carriers (I) and (II) are described in examples 1 and 2, respectively; while Carriers (III) and (IV) are described in comparative examples 3 and 4, respectively. As a convenience, footnotes appear in the table and serve to identify the page and line numbers of the various terms that are located in the Specification. Referring to the Table, it can be seen that the core particle size for Carriers (I), (III), and (IV) are the same (48 μm), while the core particle size for Carrier (II) is slightly larger (50 μm). There are two types of coating liquid, designated Coating Liquid I and II, that are used to coat the carrier core particles. They comprise the same starting chemical components in the same proportion, and differ only in the amount of time required to disperse said chemical components. All of the carrier core particles are coated in a similar manner, i.e., they are placed on a rotary bottom disc of a

fluidized bed of a coating device. The temperature of the coating device is set to 70°C for Carriers (I), (II), and (IV) and 100°C for Carrier (III). The CBDN of Carriers (I) and (II) are the same (40 nm), but the CBDN for Carrier (III) (7 nm) and Carrier (IV) (160 nm) are both different. The CBDN measurement was accomplished using electron microscopy (see Specification p. 15, l. 35 through p. 16, l. 12). Inspection of the Table shows that an increase of 2 μm of the average core particle size (*cf.* Carriers (I) and (II)) results in a 25% reduction in the specific resistance value.

As noted above, there are two ways in which the carbon black particle size can be altered. One way is to reduce the dispersion time. Inspection of the "coating liquid dispersion conditions" shows that reducing the mixing time from 20 min (Carrier (I)) to 5 min (Carrier (IV)) gives rise to four-fold increase in the carbon black particle size (i.e., 40 nm vs. 160 nm). Referring back to the discussion of agglomerate formation from aggregates (see pages 6-8 of Applicants' response filed November 12, 2003), this makes sense when one considers that carbon black samples principally contain agglomerations of carbon black aggregates. Understanding that the mere act of dispersing (or mixing) the chemical components together gives rise to shear forces that serve to disrupt the aggregate-aggregate interactions, and, thus, reduces the extent of agglomeration within a given sample. A reduction in the number of agglomerates gives rise to a smaller carbon black particle size within the coating layer. Moreover, a longer mixing time subjects the carbon black agglomerates to the shear forces for a greater amount of time, and thus, leads to an overall reduction in the size of the particles.

Additionally, carbon black particle size may be altered by varying the temperature of the coating device. Inspection of the table shows that the coating device temperature for Carrier (I) is 70°C (p. 19, lines 19-20), while the coating device temperature for Carrier (III) is 100°C (p. 26, ll. 1-2). This thirty degree temperature difference results in a 5.7-fold

reduction in the average carbon black size of Carrier (III) (7 nm) with respect to Carrier (I) (40 nm).

Consequently, in the absence of a specific disclosure which details the mixing time, or coating temperature, there can be no issue of explicit anticipation, as the two references do not describe the CBDN as contained in the resin layer. Furthermore, there can be no issue of inherent anticipation, as that would require that the carbon black in the resin layer have a CBDN that falls within the 0.01 – 0.1 μm range each and every time (MPEP § 2131). Accordingly, there can be no case of inherent anticipation, at least with respect to the disclosure of Matsuda, as it is shown that BP-2000 carbon black may have a CBDN as high as 160 nm and as low as 7 nm.

Therefore, the rejection of Claims 1-6 under 35 U.S.C. § 102 in view of either U.S. Patent 6,534,232 to Matsuda et al. (102(e)) and/or the Japanese priority application publication JP 2001-027829 of Matsuda et al. (102(b)) is respectfully traversed.

As noted above, Matsuda's disclosure cannot anticipate the claimed invention because Matsuda does not describe the CBDN of the carbon black particles encapsulated in the particle resin. Furthermore, Matsuda does not specify the conditions (mixing time and temperature) used to disperse the carbon black in the polymer resin. Consequently, Matsuda's **discrete carbon black particle size can never be known**, this is especially true when one considers the CBDN data presented for each of the Carriers I – IV (see Table).

This is in contrast to the presently claimed invention in which the conditions employed to disperse the carbon black, and other components, in the resin are known; so too are the conditions used to coat magnetite particles. These known parameters give rise to a carrier for a developer for developing an electrostatic image, comprising core particles, and a resin layer covering each of said core particles and containing carbon particles having a number average particle diameter of 0.01-0.1 μm.

Applicants have determined that the CBDN in the coating layer can be controlled at two separate stages during the production of the carrier particles: (1) when the coating liquid is prepared by dispersing the individual components in a homomixer and (2) when the coating liquid is sprayed onto the core particles.

Thus, it is kindly requested that the Examiner withdraw this rejection.

Applicants wish to reiterate the following points when considering whether or not Matsuda's disclosure renders the claimed invention obvious. Firstly, Matsuda does not disclose that the electroconductive image can be influenced by controlling the size of the impregnated carbon black particles within the coating layer of the carrier particles. Secondly, Matsuda does not disclose that the size of the carbon black particles can be altered depending upon the manner in which the coating liquid and the carrier particles are prepared. In fact, Matsuda is silent with respect to the temperature and mixing time conditions used for the preparation of the coating liquid, and does not measure the size of the carbon black particles within the coating layer. Hence, it is impossible to know the carbon black particle size within Matsuda's carrier particle. Therefore Matsuda's disclosure cannot render the claimed invention obvious, as there is no suggestion or motivation contained within Matsuda's disclosure that would lead one to expect that controlling the carbon black CBDN would influence the electroconductive properties of the carrier particles.

As noted above, the specific resistance of the carrier particle is inversely proportional to the size of the carbon black particle within the coating layer of the carrier particle. For example, when the particle size is too small, i.e., < 0.01 μm (< 10 nm), the specific resistance is unacceptably high (7.9×10^{15} Ω·cm; *cf.* Carrier (III)). Conversely, when the particle size is too large, i.e., > 0.1 μm (> 100 nm), the specific resistance is too small (5.0×10^{9} Ω·cm; *cf.* Carrier (IV)). The data in the table reveals that a higher quality electroconductive image is obtained with a developer that comprises a carrier, which comprises carbon black particles

impregnated in a coating layer whose number average particle diameter is of from 0.01 – 0.1 μm (10 – 100 nm).

This aspect is not disclosed and/or suggested by Matsuda's disclosure. Accordingly, it is kindly requested that the Examiner acknowledge the same and deem that the pending claims are unobvious in view of Matsuda's disclosure.

Using the same line of reasoning as outlined above coupled with evidence, in the form of a Declaration under 37 CFR § 1.132 which is concurrently filed herewith, the rejection of Claims 1 and 6 under 35 U.S.C. § 102(b) in view Yoshino et al. (US 5,849,448) is traversed.

Since Yoshino does not report the size of the particles within the resin layer, it is impossible to say exactly what average carbon black particle size is present in these carrier particles. Unless Yoshino employed techniques that produced shear forces great enough to fracture the aggregates, an ordinarily skilled artisan would necessarily conclude that Yoshino's carbon black average particle diameter is greater than 100 nm (0.1 μm). It is noted that Yoshino describes a parameter that allows one potentially to ascertain the carbon black average particle diameter is found in the disclosure at col. 9, ℓℓ. 53-55.

Mr. Hiroaki Matsuda, a named co-inventor of the above-identified application supervised experimentation aimed at determining the CBDN obtained after dispersing carbon black in a liquid in a manner as described by Yoshino. In short, Mr. Matsuda declares that "the carbon black disclosed in Yoshino et al. has a number average particle diameter of more than 0.1 μm." Accordingly, there can be no inherent anticipation, as the Office has alleged, in view of this evidence.

Therefore, Yoshino does not inherently anticipate a carrier for a developer for developing an electrostatic image, comprising core particles, and a resin layer covering each of said core particles and comprising carbon particles having a number average particle diameter of 0.01-0.1 μm.

It is respectfully requested that the Examiner withdraw this rejection.

In a similar vein as that which is described above with respect to Matsuda, Yoshino does not render the claimed invention obvious. Yoshino does not disclose or suggest that the electroconductive image can be influenced by controlling the size of the impregnated carbon black particles within the coating layer of the carrier particles. Accordingly, Yoshino's disclosure cannot render the claimed invention obvious. It is respectfully requested that the Examiner acknowledge the same.

In a like manner, the rejection of Claims 1-6 under 35 U.S.C. 103(a) over Yoshino in view of Shintani et al. (US 5,204,204) and the teachings of Diamond in "Handbook of Imaging Systems" is traversed. As noted above, Yoshino lacks a critical limitation, and simply put, the additional references do not supply what is lacking in Yoshino's disclosure. Since the combined references fails to disclose or suggest the importance of having a carrier for a developer for developing an electrostatic image, comprising core particles, and a resin layer covering each of said core particles and comprising carbon particles having a number average particle diameter of 0.01-0.1 μm; Applicants respectfully request that the Examiner withdraw this rejection.

Applicants have elected Group I (Claims 1-6). Should the Examiner determine that the elected claims are allowable, then it is respectfully requested that the Examiner permit rejoinder of the process and apparatus claims that include all the limitations of the allowed product claim. If the search and examination of an entire application can be made without serious burden, the Examiner must examine it on the merits, even though it includes Claims to distinct or independent inventions.

It is believed that the claims are in a condition for allowance. An early and favorable indication is earnestly solicited. Should the Examiner deem that a personal or telephonic interview would be helpful in advancing this application toward allowance, he or she is encouraged to contact Applicant's undersigned representative at the below-listed telephone number.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Daniel R. Evans

Richard L. Treanor
Attorney of Record
Registration No. 36,379

Daniel R. Evans, Ph.D.
Registration No. 55,868

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413-2220

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :

HIROAKI MATSUDA, ET AL. : EXAMINER: CHRISTOPHER D. RODEE

SERIAL NO.: 10/086,683 :

FILED: MARCH 4, 2002 : GROUP ART UNIT: 1756

FOR: CARRIER FOR DEVELOPER FOR DEVELOPING ELECTROSTATIC LATENT IMAGE, IMAGE FORMING METHOD USING SAME AND IMAGE FORMING APPARATUS USING SAME

DECLARATION UNDER 37 CFR 1.132

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Now comes **Hiroaki Matsuda** who deposes and states:

1. That I am a graduate of Tokyo University of Science, and received a Master degree in Science in the year of 1991.

2. That I have been employed by Ricoh Company Limited for 10 years as a researcher of Chemistry, and for 3 years as a member of Intellectual Property Department, Legal Division.

3. That I am an inventor in the above-identified application.

4. That I have read and understood US 5,849,448 Yoshino et al., which has been cited against the claims in the above-identified application.

5. That the carbon black disclosed in Yoshino et al. has a number average particle diameter of more than 0.1 μm. The reasons are set out in pages 2-3 that follow.

6. That the following additional experiment was conducted under my supervision on July 2, 2004.

Experiment:

Coating liquid A corresponding to the present invention and coating liquid B corresponding to Example 1 of Yoshino et al. were prepared as described follow, and thereafter the settling of carbon black was observed and the observation by an optical microscope was conducted on the prepared coating liquid A and B.

Preparation of Coating liquid A

600 g of toluene, and 3 g of carbon black BP-2000 (Cabot Cop.) were placed in a homomixer and were dispersed for 20 minutes at the jacket temperature of 35-40°C.

Preparation of Coating liquid B

280 g of toluene, and 3 g of carbon black BP-2000 (Cabot Cop.) were placed in a beaker of 500 ml and dispersed by using a stirrer for 10 minutes.

Settling of Carbon Black

30 ml of the prepared coating liquids A and B are respectively sampled and placed in a screw vial, and then the settling of carbon black was observed.

<Result>

Coating liquid A

The upper part of the liquid was clarified after 5 minutes.

Coating liquid B

The carbon black particles are completely settled within 1 minuet.

Optical microscope

The coating liquids A and B were observed by an optical microscope at a magnification of 1,000 times.

<Result>

Coating liquid A

Most of the observed particles were of submicron order.

Coating liquid B

Most of the observed particles were of micron order.

Conclusion:

In the coating liquid for a coating layer of carrier, as evidenced the above, the carbon black of Yoshino et al. has a larger average particle diameter.

In Example 1 of Yoshino et al., the coating liquid was mixed with ferrite particles and was stirred for another 30 minutes at 60°C in a kneader equipped with a vacuum deaerator. However, it is believed that no further dispersion of carbon black will occur in the kneader. As well known in the art, a surface irregularities of a ferrite particle are much larger than the carbon black, therefore the ferrite particles in the mixture do not acetate the dispersion of the carbon black. It is technically obvious that the carbon black did not further dispersed in the kneader.

Accordingly, the carbon black disclosed in Yoshino et al. has a number average particle diameter of more than 0.1 μm.

7. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

8. Further deponent saith not.

Hiroaki Matsuda

Hiroaki Matsuda

July 28, 2004

Date